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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/522,174	01/24/2005	Masanobu Awano	264455US0PCT	3565
22850 7590 06/24/2008 OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER TAI, XIUYU	
			ART UNIT 1795	PAPER NUMBER
			NOTIFICATION DATE 06/24/2008	DELIVERY MODE ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/522,174	<b>Applicant(s)</b> AWANO ET AL.	
	<b>Examiner</b> Xiuyu Tai	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 January 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) 14-39 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 January 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>1/24/2005</u> .   | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### *Election/Restrictions*

1. Claims 14-39 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 5/5/2008.
2. Applicants have elected Group I, claims 1-13 with traverse on the ground that no adequate reasons and/or examples have been provided to support a conclusion of patentable distinctiveness between identified groups. Also, it has not been shown that a burden exists in searching the claims of the five groups.
3. This is a national stage of a PCT application, consequently the rules of unity of invention applies. The special technical feature linking the five groups lacks of inventive concept. Furthermore, the search and examination of the entire application requires different search queries and/or different classification. Where the group of inventions is claimed in one and the same international application, the requirement for unity of invention referred to in Rule 13.1 shall be fulfilled only when there is a technical relationship among those inventions involving one or more of the same or corresponding special technical features. The expression **“special technical features”** shall mean those technical features that define a contribution which each of the claimed inventions considered as a whole , **makes over the prior art**. The inventions listed as Groups I, II, III, IV, V do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, although they share the special technical feature, this special

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technical feature does not define a contribution over the prior art for the following reasons: "an oxygen ion conductor and two electrodes" is the special technical feature linking Group I, Group II, Group III, Group IV, and Group V. "An oxygen ion conductor and two electrodes" is known in the art, such as the reference by Hibino et al "Medium-temperature electrolysis of NO and CH<sub>4</sub> under lean-burn conditions using Ytria-stabilized Zirconia as a Solid Electrolyte", J.CHEM. SOC. FARADAY TRANS., 91(13), 1955-1959, 1995. Accordingly, the special technical feature does not provide a contribution over the prior art. Therefore, the restriction is appropriate.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-3, 5-8, and 10-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Hibino ("Medium-temperature electrolysis of NO and CH<sub>4</sub> under lean-burn conditions using Ytria-stabilized Zirconia as a Solid Electrolyte", J.CHEM. SOC. FARADAY TRANS., 91(13), 1955-1959, 1995) in evidence of Arai et al (U.S. 6,322,910).

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6. Regarding claim 1, Hibino et al disclose a single-compartment reactor.

The reactor comprises: (1) a solid electrolyte YSZ as an oxygen ion conductor (Figure 1; page 1953); and (2) two Pd electrode in the form of porous film as cathode and anode (Figure 1; page 1956). The reactions take place at cathode and anode depending on exhaust gases introduced into the reactor while a current is applied between cathode and anode (Figure 1; page 1955).

7. Regarding claims 2 and 7, as taught by Hibino, the boundaries between YSZ and cathode/anode electrode have a metal phase of Pd electrode and some gap due to the presence of small particle grains. Hibino is silent about an oxygen deficient layer. However, Arai et al disclose an organic electroluminescent device. Arai teaches that an oxygen-deficient layer is formed under oxygen-lacking condition (with no addition of oxygen, oxygen content of 60%-90%) while an oxide layer is formed under oxygen-rich environment (with the addition of oxygen, col. 4, line 55-65). Pd electrode of Hibino is attached to YSZ by electroless plating method in a mixed solution of 0.5% PdCl<sub>2</sub> and 6% N<sub>2</sub>H<sub>4</sub>·2HCl at 90°C (page 1956 of Hibino), which is under oxygen-lacking conditions (i.e. in an aqueous solution at higher temperature). Therefore, an oxygen-deficient layer is inherently formed at the boundaries of Pd electrode and YSZ from Hibino's method as is evident by the teaching of Arai.

8. Regarding claim 3, if only NO is introduced into the reactor, the reaction takes place at the cathode (Figure 1; page 1955), reads on the instant claim.

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9. Regarding claim 5, the reaction on the Pd cathode is the reduction of NO to N<sub>2</sub> achieved by using YSZ as solid electrolyte (page 1955), reads on the instant claim.

10. Regarding claim 6, the reference also teaches that as an alternative attachment method, Pd pastes with particle size less than 0.1 um were smeared on the left and right sides of electrolyte (page 1956), implying that electrodes contains small size particles, reads on the instant claim.

11. Regarding claim 8, the single compartment reactor has a structure that YSZ as an ion conductor contacts with Pd cathode and Pd anode (Figure 1; page 1956), reads on the instant claim.

12. Regarding claim 10, the reaction on the cathode is the reduction of NO to N<sub>2</sub> that is a conversion reaction of matter (NO to N<sub>2</sub>; page 1955; Figure 1), reads on the instant claim.

13. Regarding claim 11, the exhaust gas introduced into the cathode is NO (Figure 1; page 1955), reads on the instant claim.

14. Regarding claim 12, the reaction on the cathode is the reduction of NO to N<sub>2</sub> (page 1955; Figure 1), reads on the instant claim.

***Claim Rejections - 35 USC § 103***

15. Claims 9 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hibino as applied to claim 1 above, and further in view of Diekmann et al (U.S. 6,268,076).

16. Regarding claim 9, Hibino fails to teach a barrier layer on the cathode. However, Diekmann et al disclose a current collector for solid oxide full cell. The

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reference Diekmann states that a barrier layer is added to the cathode side to vanishingly low electric conductivity, ensuring enough electrical current between cathode and anode for electrochemical reaction (col. 2, line 5-12). Therefore, it would be obvious for one having ordinary skill in the art to include a barrier layer as suggested by Dieckmann into the reactor of Hinibo in order to ensure enough electrical current for electrochemical reaction to remove exhaust gases.

17. Regarding claim 13, since the barrier layer contains metallic alloy (col. 1, line 53-55) and  $Al_2O_3$ , a chemical reaction takes place as cited in the instant claim.

18. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hibino as applied to claim 1 above, and further in view of Chandran et al (PG. Pub. U.S. 2002/0003085).

19. Regarding claim 4, Hinibo fails to teach a working electrode layer on the upper part of the cathode. However, Chandran et al disclose an electrochemical cell for producing high oxygen concentration. The cell includes a plurality of cathodic layers 52 and 54 (Figure 3; paragraph [0030]). Chandran further indicates that the conductive porous layer 54 of platinum coated on the cathode 52 can reduce voltage droop and is permeable to gas, hence improving reaction efficiency (paragraph [0010] & [0030]). Therefore, it would be obvious for one having ordinary skill in the art to include another cathodic layer on the cathode as suggested by Chandran in order to improve electrochemical reaction efficiency of Hinibo.

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### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Xiuyu Tai whose telephone number is 571-270-1855. The examiner can normally be reached on Monday - Friday, 7:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/X. T./  
Examiner, Art Unit 1795

/Alexa D. Neckel/  
Supervisory Patent Examiner, Art Unit 1795